

U.S. Patent Application Serial No. **09/816,784**
Amendment dated May 6, 2004
Reply to OA of **February 12, 2004**

REMARKS

Claims 8-28 are pending in this application. Claim 8 has been withdrawn from consideration as being drawn to a non-elected invention.

Claims 1-7 have been canceled without prejudice or disclaimer, and have been rewritten as new claims 9-28.

New claims 9-28 find support throughout the specification, examples and claims, as originally filed.

Specifically, claims 9-28 requiring reactive dry etching where the alloy layer is selectively etched, find support in the specification at page 3, lines 5-16, page 4, lines 4-19, Figs 2 and 4 and their description on page 5, page 8, lines 16 and 21, page 9, lines 2, 17-18, and 22-23, and page 10, line 19.

Claims 13-17 and 26-28 requiring first forming a resist pattern, find support in the present specification, at page 4, lines 20-25, Fig. 1, page 7, page 8, line 12 (forming a patterned mask), and page 11, lines 23-25.

Claims 18-21 requiring the claimed etch ratio, find support in the specification at page 3, page 4, lines 13-16, page 9, lines 16-18, and page 10, lines 9-14.

Claims 22-25 requiring that etching does not substantially progress from an edge of the mask, find support in the present specification, at page 3, page 4, lines 16-18, the Figures, page 10, lines 15-16, and page 11, lines 10-18.

No new matter has been added.

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In view of the new claims and the remarks set forth below, further and favorable consideration, is respectfully requested.

I. *Claims 1-4 and 7 are rejected under 35 U.S.C. §103(a) as being unpatentable over Gibbons et al. (US 6,421,212), in view of DeOrnellas et al. (U.S. 6,287,975) and further in view of Kikitsu et al. (US 6,602,620).*

A. The Rejection:

Responsive to Applicant's arguments that the combination of Gibbons with DeOrnellas is improper, the Examiner states that Gibbons suggests forming a protective layer of Ta/Tantalum over/on the layer 150 is desirable and that the motivation to combine the references comes from DeOrnellas (who teaches the advantage of using Ta as a mask). The Examiner concludes that it would have been obvious to the skilled artisan to employ DeOrnellas' teaching in Gibbons method using the gas mixture of Kikitsu, to produce the instant claimed invention.

B. The Present Claims:

New claims 9-28 require "reactive" dry-etching where the alloy layer is selectively etched. New claims 13-17 and 26-28 require forming a resist pattern on the cobalt-platinum alloy layer. Claims 26-28 further require forming a patterned mask. Support for claims 9-28 appears throughout the specification, examples and claims, as originally filed. No new matter has been added.

C. Gibbons:

Claims 9-28: Gibbons requires directional *non-selective* etching in order to remove the taper and overhang portions. Gibbons discloses in the paragraph bridging cols. 6 and 7, that suitable

directional etching methods include static etching, continuous rotation etching, a combination of static and continuous rotation etching, rocking etching and ion milling. These methods are known in the semi-conductor industry as being “non-selective”. For example, ion milling is defined in the industry as a non-selective sputter etch process (please see: <http://semiconductorglossary.com>). ***Accordingly, Gibbons does not teach or suggest a reactive dry etching process***, as required by present claims 9-28.

Claims 22-25: Gibbons states that it is preferred that the bias material 150 is etched so that the sidewall etch rate is ***maximized*** by adjusting the etching tilt angle and the rotation angle to provide the desired results. (see cols. 6 and 7, and col. 8). ***Accordingly, Gibbons does not teach or suggest a method where side etching does not substantially progress***, as required by present claims 22-25.

Claims 13-17 and 26-28: Gibbons teaches producing only a “partially fabricated...thin film read head”, and teaches at col. 7, lines 31-33, that additional layers are typically formed over the leads (provided on the bias layer) and magneto resistive element, as known in the art. ***Accordingly, Gibbons does not teach or suggest forming a resist pattern or a patterned mask***, as required by present claims 13-17 and 26-28.

Gibbons, as discussed above, teaches that the bias layer 50 (etched to remove overhang) is typically provided with additional layers as known in the art, i.e., the bias layer is an internal layer having leads provided on its surface.

Claims 18-21: The present invention requires reactive/selective etching where the ratio of etch rates between the Ta or TaN mask and the CoPt layer is sufficiently large so as to prevent mask deformation thereby allowing transfer of the mask pattern to the CoPt layer such that the precise shape of the mask pattern is maintained in the produced CoPt patterned layer. *Gibbons does not teach or suggest a reactive dry etch process, let alone such a process having the claimed ratio of etch rate*, as required by present claims 18-21.

D. No motivation to modify the process of Gibbons:

It is submitted that a *prima facie* case of obviousness has not been established because neither Gibbons nor DeOrnellas' provide any motivation to modify Gibbons to include the teachings of DeOrnellas', i.e., the advantages of including the Ta layer.

MPEP 2143 discusses the requirements of a *prima facie* case of obviousness. First there must be some suggestion or motivation to combine the reference teachings or to modify the reference, and second there must be a reasonable expectation of success. Finally, the prior art reference or references when properly combined, must teach or suggest all the claim limitations.

Further, where the prior art conflicts, all teachings must be considered. The fact that references can be combined or modified is not sufficient to establish *prima facie* obviousness. MPEP 2143.01 further states that a proposed modification cannot render the prior art unsatisfactory for its intended purpose. If it does, then there is no suggestion or motivation to make the proposed modification. Further, the proposed modification cannot change the principle operation of a reference. MPEP 2141.02 states that prior art must be considered in its entirety, including

disclosures that teach away from the claims. See also MPEP 2145 (X)(D).

Gibbons requires a non-selective directional etch process. Gibbons does not teach or suggest forming a resist pattern or a patterned mask. Thus, the skilled artisan would have no motivation to employ Ta as a mask layer in view of DeOrnellas' teaching that Ta protects a part of the layer to be etched *in order to define the feature*, because Gibbons does not teach or suggest producing a patterned CoPt layer, i.e., there are *no* features to be defined. Gibbons teaches providing the CoPt layer with a *Ta overlayer*. The alloy layer and the Ta overlayer are continuous and not patterned. Please see the Figures of Gibbons.

Specifically, Gibbons teaches that the bias layer 50 (which refers to the bias layer *after* non-selective, directional etching) is "formed with a generally planer top surface". See col. 6, lines 52-55, and Fig. 7. Thus, the skilled artisan would not be motivated to provide the CoPt layer of Gibbons with a Ta mask layer, because Gibbons requires the CoPt layer *after etching*, to be "generally planer" i.e., as can be seen from Fig. 7, this appears to mean not etched.

It is also noted that *because the etch process of Gibbons is not selective*, even if motivation to provide the CoPt layer of Gibbons with a Ta mask layer, existed, the provision of such would not be expected to have any affect or to define any feature because Gibbons requires non-selective etch processes.

E. DeOrnellas:

DeOrnellas teaches forming a photoresist layer over the hard mask layer and then etching the hard mask layer to form the patterned mask layer which is provided directly on the Pt layer to be

etched. In the present method, a patterned resist layer is formed on the CoPt layer by coating, exposing and developing, followed by depositing the hard mask layer on the patterned photoresist layer. The photoresist layer is then lifted off, and the CoPt layer having the patterned hard mask layer is then etched to form the patterned CoPt layer.

Accordingly, DeOrnellas does not suggest first forming a resist pattern on the alloy layer, as required by present claims 13-17 and 26-28.

F. Kikitsu:

Kikitsu does not overcome the deficiencies of Gibbons and/or DeOrnellas, because Kikitsu does not teach or suggest the presently claimed method requiring: reactive dry etching where the alloy layer is selectively etched (claims 9-28), first forming a resist pattern on the alloy layer (claims 13-17 and 26-28), the claimed ratio of etch rate (claims 18-21) and/or that etching of the alloy layer does not substantially progress from an edge of the mask (claims 22-25).

In view of the above and the newly presented claims, it is submitted that none of the applied references, taken alone or together, render the claimed invention obvious within the meaning of 35 USC § 103. Accordingly, the Examiner is respectfully requested to withdraw this rejection.

II. *Claims 5 and 6 are rejected under 35 U.S.C. §103(a) as being unpatentable over Gibbons et al. US 6,421,212, in view of DeOrnellas et al. (U.S. 6,287,975) and Kikitsu et al. (US 6,602,620) and further in view of Tao et al. (US 5,874,010).*

The Examiner states that neither of the primary references teach reactive sputtering a TaN mask layer using a mixture gas of Ar and nitrogen, but that Tao does teach forming a TaN mask

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using an Ar/nitrogen gas mixture.

Claims 5 and 6 correspond to new claim 15, which requires first forming a resist pattern on the alloy layer.

Specifically, claim 15 requires first forming a resist pattern on the CoPt layer and then forming a mask layer over the resist layer. As discussed above, Gibbons does not teach or suggest forming a resist layer or a mask layer. DeOrnellas does not cure the deficiencies of Gibbons, because DeOrnellas also does not teach forming a resist pattern on a CoPt layer where the mask layer is formed on the resist layer, as presently required.

Rather, DeOrnellas teaches forming a continuous hard mask layer directly on the Pt layer to be etched, then forming a resist pattern over the TaN hard mask layer. The hard mask layer having a resist pattern provided thereon, is then etched thereby forming a patterned TaN layer on the Pt layer. See Figs. 1-3 of DeOrnellas. Please see the discussion set forth above regarding the previous rejection.

It is submitted that neither of Kikitsu or Tao, cure the deficiencies of Gibbons and DeOrnellas, because they also do not teach or suggest first forming a resist pattern on a CoPt layer where the mask layer is formed on the resist layer, as required by the present claims.

In view of new claim 15, it is submitted that nothing in any of the applied references, taken alone or together, render the claimed invention obvious within the meaning of 35 USC § 103. Accordingly, the Examiner is respectfully requested to withdraw this rejection.

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In view of the remarks set forth above and the newly presented claims, it is submitted that claims 9-28 are in condition for immediate allowance. Early notice to that effect is earnestly solicited.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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